PB-240 337

GOODYEAR LAKE, OTSEGO COUNTY, NEW YORK

Pacific Northwest Environmental Research Laboratory

Prepared for:

National Environmental Research Center, Las Vegas
National Environmental Research Center, Corvallis, Oregon
New York National Guard
New York State Department of Environmental Conservation

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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REPORT
ON
GOODYEAR LAKE
OTSEGO COUNTY
NEW YORK
EPA REGION II
WORKING PAPER No. 158

WITH THE COOPERATION OF THE
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AND THE
NEW YORK NATIONAL GUARD
DECEMBER, 1974

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F O R E W O R D

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the New York Department of Environmental Conservation for professional involvement and to the New York National Guard for conducting the tributary sampling phase of the Survey.

Henry L. Diamond, Commissioner of the New York Department of Environmental Conservation, and Leo J. Hetling, Director, and Italo G. Carcich, Senior Sanitary Engineer, Environmental Quality Research, Department of Environmental Conservation, provided invaluable lake documentation and counsel during the Survey.

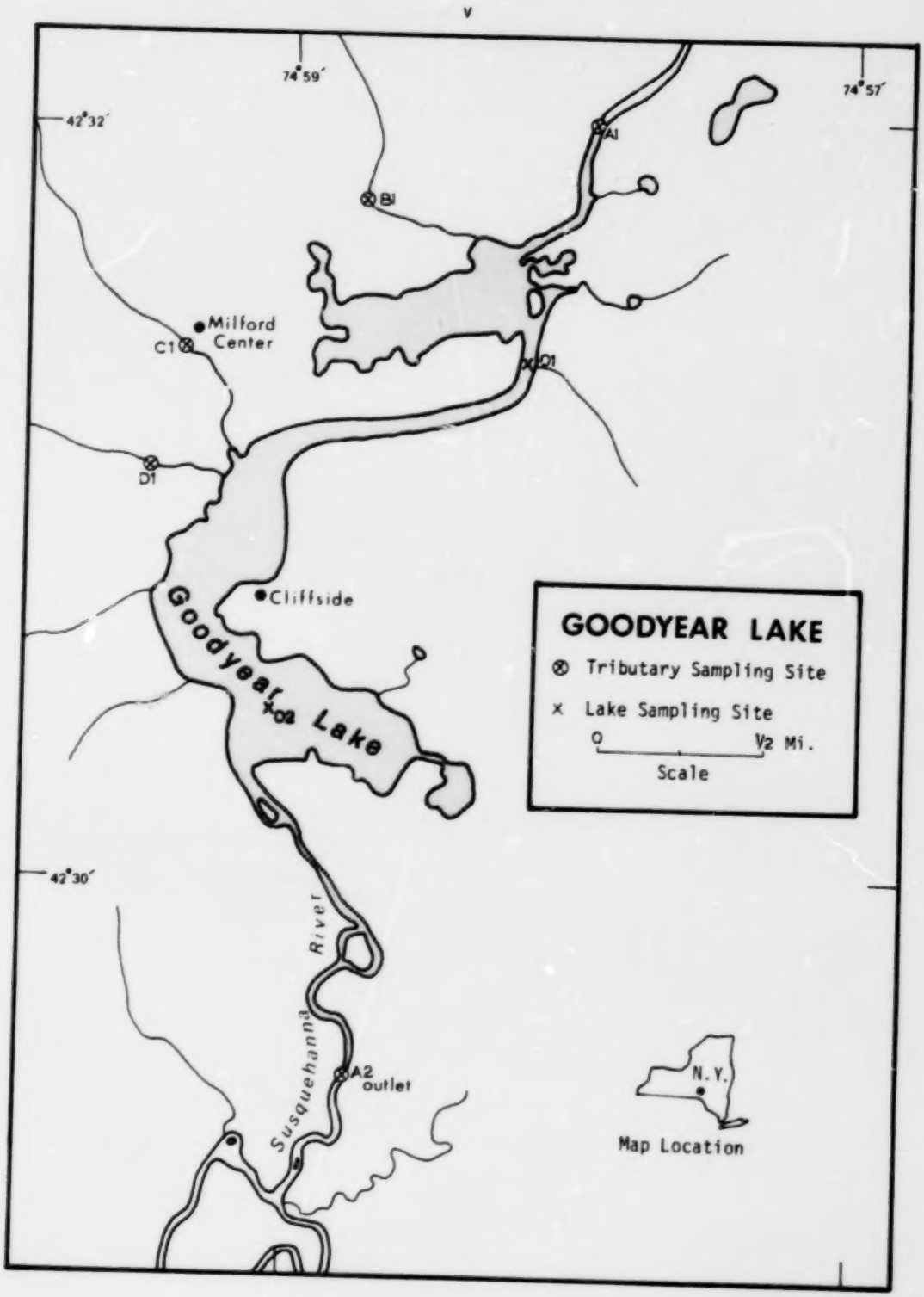
Major General John C. Baker, the Adjutant General of New York, and Project Officer Lieutenant Colonel Fred Peters, who directed the volunteer efforts of the New York National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

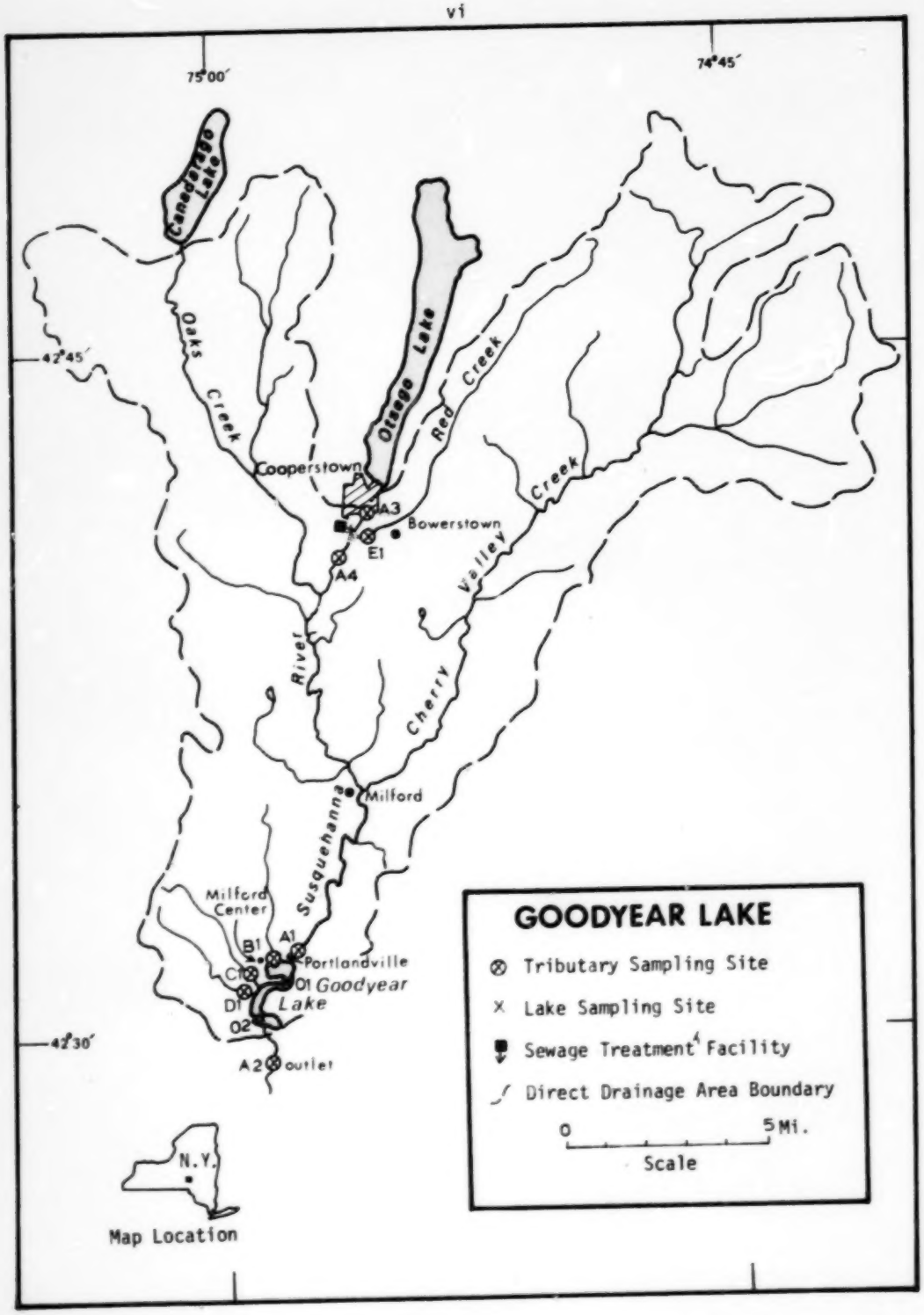
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NEW YORK

LAKE NAME	COUNTY
Allegheny Reservoir	Cattaraugas, NY; McLean, Warren, PA
Black	St. Lawrence
Canadaigua	Ontario
Cannonsville	Delaware
Carry Falls	St. Lawrence
Cassadaga	Chautauqua
Cayuga	Seneca, Tompkins
Champlain	Clinton, Essex, NY; Addison, Chittenden, Franklin, VT
Chautauqua	Chautauqua
Conesus	Livingston
Cross	Cayuga, Onondaga
Goodyear	Otsego
Huntington	Sullivan
Keuka	Ontario
Long	Hamilton
Lower St. Regis	Franklin
Otter	Cayuga
Owasco	Cayuga
Raquette Pond	Franklin
Round	Saratoga
Sacandaga Res.	Fulton, Saratoga
Saratoga	Saratoga
Schroon	Essex, Warren
Seneca	Seneca, Schyler, Yates
Swan	Sullivan
Swinging Bridge Res.	Sullivan


74°59′
74°57′
42°32′
42°30′
A1
B1
C1
Milford Center
D1
O1
O2
Cliffside
Goodyear Lake
Susquehanna River
A2 outlet
GOODYEAR LAKE
⊗ Tributary Sampling Site
× Lake Sampling Site
0 ½ Mi.
Scale
N.Y.
Map Location


75°00'
74°45'
42°45'
42°30'
Canadarago Lake
Otsego Lake
Oaks Creek
Red Creek
Cooperstown
Bowerstown
Valley Creek
A3
E1
A4
River
Cherry
Susquehanna
Milford
Milford Center
B1
A1
Portlandville
C1
O1
Goodyear Lake
D1
O2
A2
outlet
N.Y.
Map Location
GOODYEAR LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Direct Drainage Area Boundary
0
5 Mi.
Scale

GOODYEAR LAKE

STORET NO. 3613

I. CONCLUSIONS

A. Trophic Condition:

Survey data show that Goodyear Lake is eutrophic. Of the 26 New York lakes sampled in the fall of 1972, 14 had less mean total and dissolved phosphorus, and 10 had less mean inorganic nitrogen. For all New York data, 12 had less mean chlorophyll a, and 18 had greater Secchi disc transparency.

Survey limnologists observed heavy growths of rooted aquatic vegetation in the inlet arm of the lake.

B. Rate-Limiting Nutrient:

Algal assay results show that Goodyear Lake was phosphorus limited in October when the assay sample was collected. The lake data indicate phosphorus limitation in May and July as well (N/P ratios were 55/1 and 24/1, respectively).

C. Nutrient Controllability:

1. Point sources--During the sampling year, Goodyear Lake received a total phosphorus load at a rate more than four times that proposed by Vollenweider (in press) as "dangerous"; i.e., a eutrophic rate (see page 11). Of that load, it is calculated that Cooperstown and Milford contributed just over 16%. Even 100% phosphorus removal at these point sources would still leave

a loading rate of about 12.5 $g/m^2/yr$ (more than 3½ times the eutrophic rate), and it is concluded that point-source control of phosphorus would not result in a significant improvement of the trophic condition of Goodyear Lake.

2. Non-point sources (see page 11)--Except for the Susquehanna River, the phosphorus exports of the Goodyear Lake tributaries were similar to those of unimpacted New York streams studied elsewhere. However, the export of the Susquehanna River was nearly twice the mean export of the other tributaries and probably was due to point sources beyond the 25-mile limit of the Survey*.

In appears that the large drainage area to lake area ratio of about 582 to 1 will ensure an excessive phosphorus load to Goodyear Lake from non-point sources alone. Note that even if the lowest non-point phosphorus export measured (station D-1 = 56 $lbs/mi^2/yr$) was typical of the entire drainage, the phosphorus loading rate would still be 6.0 $g/m^2/yr$, or nearly twice the eutrophic rate.

* See Working Paper No. 1, "Survey Methods".

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry:

1. Surface area: 365 acres†.
2. Mean depth: unknown.
3. Maximum depth: >23 feet.
4. Volume: unknown.
5. Mean hydraulic retention time: unknown.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area*	Mean flow*
Susquehanna River	327.0 mi^2	516.9 cfs
Unnamed Stream (B-1)	11.3 mi^2	16.6 cfs
Unnamed Stream (C-1)	2.6 mi^2	3.9 cfs
Unnamed Stream (D-1)	3.9 mi^2	5.8 cfs
Minor tributaries & immediate drainage -	4.6 mi^2	7.5 cfs
Totals	349.4 mi^2	550.7 cfs

2. Outlet -

Susquehanna River	350.0 mi^2**	550.7 cfs

C. Precipitation***:

1. Year of sampling: 49.0 inches.
2. Mean annual: 41.8 inches.

† Greeson and Robison, 1970.
* Drainage areas are accurate within ±5%, except for small basins (±10%); mean daily flows are accurate within ±5 to 25%; and normalized mean monthly flows are accurate within ±15%.
** Includes area of lake.
*** See Working Paper No. 1.

III. LAKE WATER QUALITY SUMMARY

Goodyear Lake was sampled twice during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. In May and October, samples for physical and chemical parameters were collected from a number of depths at one station on the lake (a second station was added during the fall sampling; see map, page v). During each visit, a single depth-integrated (15 feet or near bottom to surface) sample was obtained from the station(s) for phytoplankton identification and enumeration; and during the last visit, a single five-gallon depth-integrated sample was composited from the two stations for algal assays. Also each time, a depth-integrated sample was collected from station one for chlorophyll a analysis. The maximum depths sampled were 23 feet at station 1 and 9 feet at station 2.

The results obtained are presented in full in Appendix B, and the data for the fall sampling period, when the lake essentially was well-mixed, are summarized below. Note, however, the Secchi disc summary is based on all values.

For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

Parameter	Minimum	Mean	Median	Maximum
		FALL VALUES (10/11/72)		
Temperature (Cent.)	11.0	12.4	12.3	13.7
Dissolved oxygen (mg/l)	9.0	9.4	9.1	10.0
Conductivity (μmhos)	260	262	262	265
pH (units)	7.7	7.7	7.7	7.8
Alkalinity (mg/l)	104	107	107	108
Total P (mg/l)	0.023	0.032	0.031	0.043
Dissolved P (mg/l)	0.009	0.011	0.013	0.016
NO_2 + NO_3 (mg/l)	0.120	0.149	0.150	0.170
Ammonia (mg/l)	0.050	0.110	0.100	0.190
		ALL VALUES		
Secchi disc (inches)	36	54	54	72

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
05/21/72	1. Synedra	593
	2. Dinobyron	586
	3. Fragilaria	239
	4. Cryptomonas	231
	5. Melosira	94
	Other genera	556
	Total	2,299
07/28/72	1. Tabellaria	3,637
	2. Cyclotella	318
	3. Dinobyron	267
	4. Chroococcus	137
	5. Oocystis	130
	Other genera	189
	Total	4,678
10/11/72	1. Fragilaria	1,148
	2. Dinobryon	841
	3. Cryptomonas	497
	4. Cyclotella	344
	5. Melosira	217
	Other genera	841
	Total	3,888

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/21/72	01	12.5
07/28/72	01	2.4
10/11/72	01	10.3
	02	13.2

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.006	0.253	0.3
0.010 P	0.016	0.253	5.3
0.020 P	0.026	0.253	6.5
0.050 P	0.056	0.253	7.4
0.050 P + 5.0 N	0.056	5.253	23.0
0.050 P + 10.0 N	0.056	10.253	22.4
10.0 N	0.006	10.253	0.6

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Goodyear Lake was moderate at the time the sample was collected. Also, increasing yields with increasing concentrations of orthophosphorus show that the lake was limited by phosphorus at that time. Note that the addition of only nitrogen produced a yield not significantly different than the control.

The lake data further substantiate phosphorus limitation. On all occasions, the nitrogen to phosphorus ratio was 19/1 or greater, and phosphorus limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the New York National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page vi), except for the high runoff months of April and May when two samples were collected. Sampling was begun in November, 1972, and was completed in October, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the New York District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in lbs/mi^2/year, at stations B-1, C-1, and D-1 and multiplying the means by the ZZ area in mi^2.

The operator of the Cooperstown wastewater treatment plant provided monthly effluent samples and corresponding flow data; however, the untreated waste of the Village of Milford was not sampled, and nutrient loads were estimated at 3.5 lbs P and 9.4 lbs N/capita/year.

Nutrient loads given for tributaries are those measured minus point-source loads, if any.

---

* See Working Paper No. 1.

A. Waste Sources:

1. Known muncipal† -

Name	Pop. Served*	Treatment	Mean Flow (mg/d)	Receiving Water
Cooperstown	2,403	Imhoff	0.686	Susquehanna River
Milford	527	None	0.053**	Susquehanna River

2. Known industrial - None

† Anonymous, 1971.
* 1970 Census.
** Estimated at 100 gal/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
Susquehanna River	39,020	80.1
Unnamed Stream (B-1)	740	1.5
Unnamed Stream (C-1)	190	0.4
Unnamed Stream (D-1)	220	0.5
b. Minor tributaries & immediate drainage (non-point load) -	300	0.6
c. Known municipal -		
Cooperstown	6,260	12.8
Milford	1,840	3.8
d. Septic tanks* -	110	0.2
e. Known industrial - None	-	-
f. Direct precipitation** -	60	0.1
Total	48,740	100.0

2. Outputs -

Lake outlet - Susquehanna River 35,560

3. Net annual P accumulation - 13,180 pounds

* Estimate based on 181 lakeshore dwellings; see Working Paper No. 1.
** See Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
Susquehanna River	1,039,300	91.1
Unnamed Stream (B-1)	36,800	3.2
Unnamed Stream (C-1)	7,250	0.6
Unnamed Stream (D-1)	11,300	1.0
b. Minor tributaries & immediate drainage (non-point load) -	13,800	1.2
c. Known municipal -		
Cooperstown	24,550	2.2
Milford	4,950	0.4
d. Septic tanks* -	4,250	0.4
e. Known industrial - None	-	-
f. Direct precipitation** -	3,520	0.3
Total	1,140,770	100.0

2. Outputs -

Lake outlet - Susquehanna River 1,241,680

3. Net annual N loss - 100,910 pounds

* Estimate based on 181 lakeshore dwellings; see Working Paper No. 1.
** See Working Paper No. 1.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs P/mi^2/yr	lbs N/mi^2/yr
Susquehanna River	119	3,178
Unnamed Stream (B-1)	67	3,315
Unnamed Stream (C-1)	73	2,788
Unnamed Stream (D-1)	56	2,897

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	133.5	36.1	3,125.4	loss*
grams/m^2/yr	14.97	4.05	350.3	-

Vollenweider loading rates for phosphorus (g/m^2/yr) based on surface area and mean outflow of Goodyear Lake:

"Dangerous" (eutrophic rate)	3.40
"Permissible" (oligotrophic rate)	1.70

* There was an apparent loss of nitrogen during the sampling year. This may have been due to nitrogen fixation in the lake, solubilization of previously sedimented nitrogen, recharge with nitrogen-rich ground water, unknown and unsampled point sources discharging directly to the lake, or underestimation of the nitrogen loads from the Village of Milford. Whatever the cause, a similar nitrogen loss has occurred at Shagawa Lake, Minnesota, which has been intensively studied by EPA's National Eutrophication Research and Lake Restoration Branch.

V. LITERATURE REVIEWED

Anonymous, 1971. Inventory of municipal waste facilities. EPA Publ. No. OWP-1, Vol. 2, Washington, D.C.

Greson, Phillip E., and F. Luman Robison, 1970. Characteristics of New York lakes. Part 1 - Gazetteer of lakes, ponds, and reservoirs. Bull. 68, U.S. Dept. of Int. and NY State Dept. Env. Cons., Albany.

Vollenweider, Richard A. (in press). Input-output models. Schweiz. A. Hydrol.

VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR 4-W FORM 11/26/74

LAKE CODE 3613 GOODYEAR LAKE

TOTAL DRAINAGE AREA OF LAKE 350.00

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
361341	327.00	575.00	568.00	1080.00	1435.00	635.00	322.00	183.00	130.00	161.00	229.00	410.00	488.00	516.89
361342	350.00	612.00	607.00	1151.00	1522.00	678.00	342.00	192.00	138.00	170.00	243.00	441.00	525.00	550.73
361381	11.30	19.00	19.00	36.00	43.00	21.00	10.00	6.60	4.00	4.30	6.70	15.00	18.00	16.60
361301	2.62	4.30	4.40	8.50	10.00	4.90	2.40	1.10	0.90	1.00	1.50	3.50	4.30	3.90
361322	5.14	8.40	8.70	16.00	19.00	9.50	4.60	2.10	1.40	1.90	3.10	6.80	8.40	7.51

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 350.00
SUM OF SUB-DRAINAGE AREAS = 350.00

TOTAL FLOW IN = 6622.84
TOTAL FLOW OUT = 6621.00

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
361341	11	72	800.00	4	310.00				
	12	72	1400.00	2	700.00				
	1	73	1300.00	7	1300.00				
	2	73	720.00	3	1500.00				
	3	73	1300.00	4	340.00				
	4	73	1230.00	7	2370.00	21	870.00		
	5	73	820.00	5	554.00	18	1000.00		
	6	73	540.00	9	350.00				
	7	73	390.00	7	650.00				
	8	73	98.00	5	130.00				
	9	73	100.00	8	67.00				
	10	73	21.00	14	34.00				
361342	11	72	29.00	4	8.10				
	12	72	1500.00	3	740.00				
	1	73	1400.00	7	1360.00				
	2	73	760.00	3	1600.00				
	3	73	1400.00	4	430.00				
	4	73	1310.00	7	2470.00	21	920.00		
	5	73	860.00	5	565.00	18	1100.00		
	6	73	570.00	9	370.00				
	7	73	400.00	7	680.00				
	8	73	100.00	5	75.00				
	9	73	101.00	8	74.00				
	10	73	24.00	14	36.00				

TRIBUTARY FLOW INFORMATION FOR NEW YORK 11/26/74

LAKE CODE 3613 GOODYEAR LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
361301	11	72	6.80	4	1.90				
	12	72	48.00	3	28.00				
	1	73	29.30	7	20.00				
	2	73	24.00	1	44.00				
	3	73	43.00	4	25.00				
	4	73	37.00	7	56.00	21	18.00		
	5	73	18.60	5	8.70	18	50.00		
	6	73	10.00	9	5.00				
	7	73	4.60	7	10.00				
	8	73	0.30	5	0.80				
	9	73	0.30	8	0.20				
	10	73	1.70	14	1.20				
361301	11	72	10.00	4	2.80				
	12	72	11.30	3	6.60				
	1	73	6.90	7	4.80				
	2	73	4.80	1	9.30				
	3	73	8.20	4	6.30				
	4	73	8.80	7	12.00	21	3.90		
	5	73	4.00	5	1.60	18	12.00		
	6	73	2.00	9	0.90				
	7	73	0.80	7	2.40				
	8	73	0.10	5	0.10				
	9	73	0.10	8	0.10				
	10	73	0.40	14	0.40				
361301	11	72	860.00	4	330.00				
	12	72	17.00	3	4.80				
	1	73	10.00	7	7.10				
	2	73	8.30	3	23.00				
	3	73	15.00	4	8.90				
	4	73	14.00	21	7.00				
	5	73	8.43	5	0.10	18	18.00		
	6	73	5.20	9	0.10				
	7	73	0.10	7	5.00				
	8	73	0.0	4	0.0				
	9	73	0.0	8	0.0				
	10	73	0.0	14	0.0				
361327	11	72	13.00						
	12	72	22.00						
	1	73	14.00						
	2	73	9.40						
	3	73	16.00						
	4	73	18.00						
	5	73	13.00						
	6	73	8.80						
	7	73	4.80						
	8	73	1.10						
	9	73	0.50						
	9	73	0.50						
	10	73	0.80						

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/01/03

361301
42 25 00.0 074 55 00.0
GOODYEAR LAKE
36 NEW YORK

11EPALES 2111202
6 0020 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/05/21	18	35 0000	17.9	11.9	36	200	7.60	82	0.420	0.050	0.024	0.008
	18	35 0010	15.6	11.5		200	7.30	85	0.440	0.060	0.026	0.008
	18	35 0017	14.9	10.4		200		88	0.440	0.080	0.027	0.011
72/07/28	09	40 0000			116	55	6.90	12	0.040	0.060	0.008	0.004
	09	40 0004	23.6	7.6		55	6.80	11	0.040	0.070	0.008	0.006
	09	40 0015	16.1	10.2		60	6.10	11	0.040	0.070	0.013	0.007
	09	40 0023	7.9	0.4		60	6.30	11	0.050	0.110	0.016	0.004
72/10/11	12	20 0000			84	260	7.80	107	0.130	0.180	0.031	0.011
	12	20 0004	13.7	9.0		260	7.80	107	0.120	0.190	0.026	0.013
	12	20 0015	13.4	9.1		262	7.70	108	0.150	0.120	0.026	0.009
	12	20 0022	12.3	9.0		265	7.70	110	0.150	0.100	0.023	0.010

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/05/21	18	35 0000	12.5J
72/07/28	09	40 0000	2.4J
72/10/11	12	20 0000	10.3

J= VALUE KNOWN TO BE ± ERROR

STORET RETRIEVAL DATE 75/01/03

361302
42 25 00.0 074 55 00.0
GOODYEAR LAKE
36 NEW YORK

11EPALES
6

2111202
0022 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/10/11	12 00	0000			60	262	7.70	104	0.160	0.070	0.036	0.015
	12 00	0004	11.8	9.8		265	7.80	108	0.160	0.060	0.039	0.014
	12 00	0009	11.0	10.0		262	7.70	106	0.170	0.050	0.043	0.016

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/10/11	12 20	0000	13.2

J* VALUE KNOWN TO BE IN ERROR

APPENDIX C

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 74/11/26

3613A1 LS3613A1
42 32 00.0 074 58 00.0
SUSQUEHANNA RIVER
36 7.5 MILFORD
1/GOODYEAR LAKE
BANK OF ST HWY 28 N OF PORTLANDVILLE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	12 45		0.420	0.300	0.050	0.025	0.066
72/12/02	09 45		0.530	0.330	0.014	0.005K	0.025
73/02/03	09 52		0.560	0.690	0.066	0.010	0.080
73/03/04	09 30		0.780	0.660	0.088	0.012	0.070
73/04/07			0.550	0.360	0.035	0.005K	0.040
73/04/21	09 30		0.470	0.440	0.016	0.005K	0.035
73/05/05	09 10		0.400	1.150	0.040	0.008	0.045
73/05/18	09 45		0.280	0.660	0.021	0.010	0.040
73/06/09	11 30		0.220	1.380	0.052	0.006	0.050
73/07/07	09 45		0.315	0.460	0.024	0.024	0.050
73/08/05	10 05		0.010K	1.200	0.220	0.007	0.050
73/09/08	10 15		0.023	0.680	0.100	0.006	0.030
73/10/14	11 50		0.010K	1.000	0.030	0.005K	0.040

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3613A2 LS3613A2
42 29 30.0 074 59 00.0
SUSQUEHANNA RIVER
36 7.5 W DAVENPORT
O/GOODYEAR LAKE
ST HWY 7 BRDG NEAR COLLIERSVILLE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	10 10		0.230	0.380	0.044	0.010	0.05H
72/12/03	10 15		0.590	0.350	0.025	0.007	0.030
73/01/07	09 35		0.630	0.330	0.015	0.005K	0.030
73/02/03	10 20		0.580	0.230	0.033	0.006	0.030
73/03/04	10 12		0.690	0.440	0.058	0.024	0.050
73/04/07	10 25		0.500	0.350	0.020	0.005K	0.040
73/04/21	09 50		0.480	0.460	0.023	0.005K	0.025
73/05/05	10 30		0.410	0.760	0.011	0.005K	0.035
73/05/18	10 10		0.252	3.200	0.085	0.006	0.040
73/06/09	10 50		0.010K	1.100	0.008	0.005K	0.045
73/07/07	09 45		0.290	0.520	0.033	0.021	0.035
73/08/05	10 40		0.120	0.370	0.058	0.006	0.020
73/09/08	10 38		0.075	0.920	0.042	0.007	0.030
73/10/14	12 13		0.210	2.000	0.115	0.005K	0.015

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3613A3 LS3613A3
42 41 30.0 074 55 30.0
SUSQUEHENNA RIVER
36 7.5 COOPERSTOWN
I/GOODYEAR LAKE
BRDG S PART OF COOPERSTOWN ABOV STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	11 10		0.286	0.230	0.034	0.005K	0.044
72/12/03	09 00		0.427	0.180	0.015	0.005K	0.011
73/01/07	08 50		0.500	0.210	0.009	0.005K	0.010
73/02/03	09 08		0.480	0.220	0.021	0.005K	0.015
73/03/04	08 20		0.520	0.290	0.028	0.006	0.015
73/04/07	09 00		0.490	0.260	0.009	0.005K	0.015
73/04/21	09 50		0.490	0.880	0.065	0.005K	0.010
73/05/05	09 58		0.500	0.780	0.007	0.005K	0.010
73/05/18	09 07		0.500	1.680	0.063	0.005K	0.015
73/06/09	09 57		0.420	1.360	0.022	0.005K	0.010
73/07/07	09 00		0.310	0.320	0.021	0.006	0.010
73/08/05	09 40		0.063	0.620	0.138	0.005K	0.025
73/09/08	09 21		0.105	0.540	0.036	0.007	0.020
73/10/14	11 20		0.080	0.500	0.029	0.007	0.035

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3613A4 LS3613A4
42 41 00.0 075 56 30.0
SUSQUEHANNA RIVER
36 7.5 COOPERSTOWN
I/GOODYEAR LAKE
BRDG OFF ST HWY 26 BELO COOPERSTOWN STP
11FPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	12	05	0.420	0.420	0.100	0.056	0.091
72/12/03	09	20	0.480	0.220	0.024	0.009	0.024
73/01/07	09	10	0.510	0.310	0.016	0.006	0.020
73/02/03	09	23	0.520	0.540	0.085	0.010	0.060
73/03/04	08	40	0.620	1.150	0.147	0.023	0.095
73/04/07	09	20	0.520	0.440	0.058	0.005K	0.030
73/04/21	09	05	0.490	0.350	0.023	0.008	0.025
73/05/05	10	12	0.530	0.720	0.078	0.017	0.035
73/05/18	09	25	0.470	3.000	0.120	0.013	0.065
73/06/09	10	15	0.420		0.034	0.020	0.040
73/07/07	09	20	0.320	0.440	0.040	0.008	0.035
73/08/05	10	00	0.980	1.320	0.580	0.450	0.525
73/09/08	09	33	0.680	2.940	2.000	0.460	0.550
73/10/14	11	30	0.710	2.700	0.890	0.480	0.575

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3613R1 LS3613R1
42 32 00.0 074 59 00.0
UNNAMED BROOK
36 7.5 MILFORD
T/GOODYEAR LAKE
ST HWY 29 BRDG
11FPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	13 05		0.530	0.390	0.031	0.007	0.021
72/12/03	09 50		0.075	0.140	0.015	0.005K	0.016
73/01/07	09 35		1.180	0.240	0.011	0.005K	0.010
73/02/03	10 00		0.560	0.460	0.078	0.018	0.060
73/03/04	10 00		0.660	0.690	0.096	0.013	0.065
73/04/07	10 15		0.110	0.170	0.020	0.005K	0.015
73/05/05	10 15		0.330	0.860	0.024	0.005K	0.020
73/05/18	09 20		0.280	1.380	0.063	0.008	0.040
73/06/09	10 35		0.470	0.440	0.005K	0.005K	0.010
73/07/07	10 05		0.900	0.250	0.017	0.006	0.015
73/08/05	10 20		1.260	0.140	0.044	0.011	0.020
73/09/08	10 18		1.420	0.310	0.038	0.007	0.020
73/10/14	12 00		0.990	1.250	0.092	0.011	0.015

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3613C1 LS3613C1
42 31 30.0 074 59 30.0
UNNAMED CREEK
36 7.5 MILFORD
T/GOODYEAR LAKE
ST HWY 29 BRDG IN MILFORD CENTER
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	13 15		0.169	0.230	0.032	0.005K	0.019
72/12/03	10 00		0.036	0.130	0.018	0.005K	0.012
73/01/07	09 40		0.710	0.190	0.014	0.005K	0.010
73/02/03	10 10		0.470	0.400	0.052	0.010	0.040
73/03/04	09 10		0.730	0.700	0.132	0.022	0.080
73/04/07	10 10		0.294	0.205	0.005K	0.005K	0.015
73/04/21	09 40		0.430	0.270	0.009	0.005K	0.010
73/05/05	10 00		0.260	0.270	0.009	0.005K	0.015
73/05/18	09 58		0.210	2.700	0.083	0.008	0.035
73/06/09	10 40		0.450	1.200	0.050	0.005K	0.010
73/07/07	09 25		0.470	0.220	0.020	0.006	0.015
73/08/05	10 20		0.467	0.880	0.055	0.011	0.075
73/09/08	10 24		0.510	0.805	0.105	0.008	0.020
73/10/14	12 00		0.147	0.200	0.044	0.010	0.010

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

361301 LS361301
42 31 00.0 074 59 30.0
UNNAMED CREEK
36 7.5 MILFORD
T/GOODYEAR LAKE
ST HWY 28 BRDG S OF MILLFORD CENTER
HFPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	13 21		0.150	0.100K	0.023	0.005K	0.012
72/12/03	10 00		0.260	0.100K	0.013	0.005K	0.005K
73/01/07	09 41		0.210	0.100K	0.007	0.005K	0.010
73/02/03	10 14		0.176	0.350	0.044	0.007	0.035
73/03/04	10 05		0.370	4.200	2.200	0.014	0.055
73/04/07	09 10		0.700	0.260	0.005K	0.005K	0.025
73/04/21	09 45		0.110	0.180	0.010	0.005K	0.005K
73/05/05	10 20		0.087	0.140	0.005K	0.005K	0.010
73/05/18	10 25		0.082	1.600	0.056	0.005K	0.020
73/06/09	10 43		0.038	0.480	0.016	0.007	0.015
73/07/07	09 30		0.126	0.140	0.011	0.005K	0.010

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3613E1 LS3613E1
42 41 00.0 075 55 30.0
RED CREEK
36 7.5 COOPERSTOWN
T/GOODYEAR LAKE
BRDG NEAR COOPERSTOWN STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/04	11 40		0.550	0.360	0.042	0.006	0.006
72/12/03	09 10		0.980	0.270	0.010	0.006	0.016
73/01/07	09 55		1.000	0.370	0.033	0.006	0.015
73/02/03	09 15		0.570	0.520	0.105	0.014	0.120
73/03/04	08 30		0.750	1.540	0.294	0.030	0.145
73/04/07	10 05		0.570	0.320	0.035	0.005K	0.020
73/04/21	09 58		0.480	0.290	0.009	0.005K	0.010
73/05/05	10 05		0.320	0.410	0.035	0.005K	0.015
73/05/14	09 12		0.273	1.320	0.031	0.009	0.080
73/06/09	10 05		0.210	0.750	0.005K	0.005K	0.010
73/07/07	09 10		0.500	0.260	0.014	0.004	0.015
73/08/05	09 45		0.231	0.320	0.063	0.005K	0.020
73/09/08	09 26		0.168	0.820	0.220	0.015	0.015
73/10/14	11 26		0.066	0.200	0.025	0.007	0.007

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/27

361350 PD361350 P002340
42 41 00.0 076 56 00.0
COOPERSTOWN
34077 7.5 COOPERSTOWN
T/GOODYEAR LAKE
SUSQUEHANNA RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50050 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
72/12/27	07 45								
CP(T)-			0.970	9.875	1.160	2.200	2.630	0.856	0.788
72/12/27	16 45								
73/01/31	07 00								
CP(T)-			0.990	11.000	0.730	1.680	2.400	0.817	0.770
73/01/31	17 00								
73/03/07	07 00								
CP(T)-			0.780	10.500	1.050	2.150	3.200	0.746	0.726
73/03/07	17 00								
73/03/30	19 00								
CP(T)-			0.945	5.100	0.380	1.000	1.400	0.699	0.749
73/03/31	04 00								
73/05/07	07 00								
CP(T)-			0.810	6.000	0.070	1.900	2.400	0.900	0.897
73/05/07	16 00								
73/06/01	07 00								
CP(T)-			2.480	5.500	0.146	2.200	2.900	0.903	0.910
73/06/01	16 30								
73/07/02	07 00								
CP(T)-			2.310	3.900	0.056	1.200	1.500	1.060	0.738
73/07/02	16 30								
73/07/31	07 00								
CP(T)-			1.000	13.000	4.300	4.200	5.400	0.592	0.778
73/07/31	16 30								
73/09/04	19 00								
CP(T)-			0.670	25.300	6.900	5.020		0.715	0.571
73/09/05	05 00								
73/09/27	07 00								
CP(T)-			1.200	20.600	8.200	3.700	4.900	0.474	0.508
73/09/27	16 30								
73/10/31	07 00								
CP(T)-			2.900	15.000	2.900	3.900	5.400	0.449	0.428
73/10/31	17 00								
73/11/30	07 00								
CP(T)-			2.800	13.000	2.310	3.450	4.600	0.441	0.373
73/11/30	16 30								

STORET RETRIEVAL DATE 74/11/27

361350 P0361350 P002340
42 41 00.0 074 56 00.0
COOPERSTOWN
36077 7.5 COOPERSTOWN
T/GOODYEAR LAKE
SUSQUEHANNA RIVER
11EPALES 2141204
4 0000 FEET DEPTH

30

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/01/07	07 00								
CP(T)-			2.240	6.500	0.420	1.800	2.300	0.740	0.640
74/01/07	15 30								